CLAIM

1. A method of modifying frequency of electromagnetic radiation input into a nonlinear medium comprising:

a) forming a moving grating in said nonlinear medium by introducing at opposite ends of said nonlinear medium a first set of electromagnetic radiation having varying frequencies;

b) inputting electromagnetic radiation into said nonlinear medium at a first frequency; and

c) extracting electromagnetic radiation at a second frequency from said nonlinear medium;

said moving grating in said nonlinear medium allowing for electromagnetic radiation to be modified into said second frequency.

2. The method of claim 1, wherein said electromagnetic radiation is light.

3. The method of claim 1, wherein said varying frequencies are chosen so that said first frequency coincides with a bandgap frequency region of the moving grating in said nonlinear material.

4. The method of claim 1, wherein said input electromagnetic radiation comprises an exponentially decaying spatial dependence into said nonlinear region.

5. The method of claim 1, wherein said input electromagnetic radiation is reflected from the moving grating and propagates away at said second frequency.

6. The method as per claim 1, wherein said input electromagnetic radiation falls within one of the bandgaps of the moving grating.

7. The method of claim 1, wherein said extracted electromagnetic radiation is phase matched with said inputted electromagnetic radiation for electromagnetic radiation of bandwidths below the bandgap size of said moving grating.

8. A method of converting frequency of electromagnetic radiation input into a nonlinear medium comprising:

a. forming a moving grating in said nonlinear medium by introducing at opposite ends of said nonlinear medium a first set of electromagnetic radiation having varying frequencies;

b. inputting electromagnetic radiation into said nonlinear medium at a first frequency; and

c. extracting electromagnetic radiation at a second frequency from said nonlinear medium;

said moving grating in said nonlinear medium allowing for electromagnetic radiation to be converted into said second frequency.

9. The method of claim 8, wherein said electromagnetic radiation is light.

10. The method of claim 8, wherein said varying frequencies are chosen so that said first frequency coincides with a bandgap frequency region of the moving grating in said nonlinear material.

11. The method of claim 8, wherein said input electromagnetic radiation comprises an exponentially decaying spatial dependence into said nonlinear region.

12. The method of claim 8, wherein said input electromagnetic radiation is reflected from the moving grating and propagates away at said second frequency.

13. The method as per claim 1, wherein said input electromagnetic radiation falls within one of the bandgaps of the moving grating.

14. The method of claim 1, wherein said extracted electromagnetic radiation is phase matched with said inputted electromagnetic radiation for electromagnetic radiation of bandwidths below the bandgap size of said moving grating.

15. A device for converting frequency of electromagnetic radiation comprising a nonlinear that forms a moving grating in said nonlinear medium by introducing at opposite ends of said nonlinear medium a first set of electromagnetic radiation having varying frequencies, electromagnetic radiation is inputted into said nonlinear medium at a first frequency and extracted at a second frequency from said nonlinear medium, said moving grating in said nonlinear medium allowing for electromagnetic radiation to be converted into said second frequency.

16. The device of claim 15, wherein said electromagnetic radiation is light.

17. The device of claim 15, wherein said varying frequencies are chosen so that said first frequency coincides with a bandgap frequency region of the moving grating in said nonlinear material.

18. The device of claim 15, wherein said input electromagnetic radiation comprises an exponentially decaying spatial dependence into said nonlinear region.

19. The device of claim 15, wherein said input electromagnetic radiation is reflected from the moving grating and propagates away at said second frequency.

20. The device of claim 15, wherein said input electromagnetic radiation falls within one of the bandgaps of the moving grating.

21. The device of claim 15, wherein said extracted electromagnetic radiation is phase matched with said inputted electromagnetic radiation for electromagnetic radiation of bandwidths below the bandgap size of said moving grating.